What is claimed is:

1. An optical system of an optical pick-up for recording/reproducing data to/from a plurality of types of optical discs including a first optical disc having a relatively thick cover layer and a second optical disc having relatively thin cover layer, comprising:

a plurality of light sources that correspond said plurality of types of optical discs;

a first coupling lens that is used at least for said first optical disc; and

an objective lens that is used for said plurality of types of optical discs,

wherein said first coupling lens is located on a light source side of said objective lens,

wherein a beam for said first optical disc emitted by one of said plurality of light sources passes through said first coupling lens and is incident on said objective lens as a diverging beam, the diverging beam being given spherical aberration by said coupling lens,

wherein the spherical aberration of the diverging beam for said first optical disc and spherical aberration caused by said objective lens and a cover layer of said first optical disc cancel each other,

wherein when said objective lens shifts in a plane

substantially perpendicular to an optical axis of said objective lens, a coma component relating to the spherical aberration of the diverging beam which is shifted with respect to said objective lens is canceled by a coma generated by said objective lens and the cover layer of said first optical disc.

2. The optical system according to claim 1,

wherein the spherical aberration of the diverging beam for the first optical disc is such that an amount of wavefront delay becomes greater as a distance from a center axis of said coupling lens increases.

3. The optical system according to claim 1,

wherein a degree of divergence of the diverging beam for said first optical disc incident on said objective lens is largest of all of degrees of divergence of beams emitted by said plurality of light sources when each of the beams is incident on said objective lens.

4. The optical system according to claim 1,

wherein when said first optical disc is used, a magnification M_{OBL1} of said objective lens satisfies a condition:

$$-0.15 < M_{OBL1} < -0.03 \quad \cdots (1).$$

5. The optical system according to claim 1, further comprising a second coupling lens that is used for said second optical disc, said second coupling lens being located on the light source side of said objective lens.

6. The optical system according to claim 1,

wherein said first coupling lens is used for both of said first optical disc and said second optical disc.

7. The optical system according to claim 6,

wherein the beam for said first optical disc and a beam for said second optical disc emitted by said plurality of light sources have different wavelengths,

wherein said first coupling lens has a diffracting structure on at least one of its lens surfaces,

wherein when the beam for the second optical disc passes through said first coupling lens, the beam for the second optical disc having no aberration emerges from said first coupling lens.

8. The optical system according to claim 5,

wherein a beam for said second optical disc emerged from said second coupling lens has a wavefront having a form of a substantially flat plane.

9. The optical system according to claim 8,

wherein when said second optical disc is used, a magnification M_{OBL2} of said objective lens satisfies a condition:

$-0.01 < M_{OBL2} < 0.01$ ··· (2).

10. The optical system according to claim 6,

wherein a beam for said second optical disc emerged from said first coupling lens has a wavefront having a form of a substantially flat plane.

11. The optical system according to claim 10,

wherein when said second optical disc is used, a magnification M_{OBL2} of said objective lens satisfies a condition:

$-0.01 < M_{OBL2} < 0.01$ ··· (2).

12. The optical system according to claim 1,

wherein said objective lens is configured not to cause a coma when a beam for a certain type optical disc of said plurality of types of optical discs other than said first optical disc incident thereon inclines with respect to the optical axis of said objective lens.

13. The optical system according to claim 12,

wherein said certain type optical disc requires an image side numerical aperture largest of all of said plurality of types of optical discs.

14. The optical system according to claim 1,

wherein said objective lens satisfies a condition:

$|M_{OBL1}| > |M_{REF}|$

where M_{OBL1} represents a magnification of said objective lens when the diverging beam for said first optical disc having the spherical aberration given by said first coupling lens is incident on said objective lens, and M_{REF} represents a magnification of said objective lens at which spherical aberration caused by said objective lens and the cover layer of said first optical disc takes a value closest to zero when a hypothetical diverging beam which is equivalent to the diverging beam for the first optical disc but has no aberration is incident on said objective lens, the hypothetical diverging beam having a wavelength for said first optical disc,

wherein the spherical aberration of the diverging beam for the first optical disc is such that an amount of wavefront delay becomes greater as a distance from a center axis of said coupling lens increases.

15. The optical system according to claim 1,

wherein said first coupling lens is configured to be a meniscus lens having a convex side thereof located on an optical disc side and to satisfy a condition:

$1.0 < (Ra+Rb)/(Ra-Rb) < 15.0$ ··· (3)

where Ra represents a radius of curvature of a light source side surface of said first coupling lens, and Rb represents a radius of curvature of an optical disc side surface of said first coupling lens,

wherein one of the light source side surface and the optical disc side surface of said first coupling lens has an aspherical surface having a positive aspheric amount at a maximum effective diameter thereof.

16. The optical system according to claim 15,

wherein said optical system satisfies a condition:

$0.15 < (-Rb/f) \times (M_{OBL1}/M_{REF})^4 < 0.55$ (4)

where M_{OBL1} represents a magnification of said objective lens when the diverging beam for said first optical disc having the spherical aberration given by said first coupling lens is incident on said objective lens, M_{REF} represents a magnification of said objective lens at which spherical aberration caused by said objective lens and the cover layer of said first optical disc takes a value closest to zero when a hypothetical diverging beam which is

equivalent to the diverging beam for the first optical disc but has no aberration is incident on said objective lens, and f represents a focal length of said first coupling lens, the hypothetical diverging beam having a wavelength for said first optical disc.

17. The optical system according to claim 14,

wherein said objective lens further satisfies a condition:

$1.02 < M_{OBL1}/M_{REF} < 1.05$ (5).

18. The optical system according to claim 1,

wherein said first coupling lens satisfies a condition:

$-1.0 < (Ra+Rb)/(Ra-Rb) < 7.0$ ... (6)

where Ra represents a radius of curvature of a light source side surface of said first coupling lens, and Rb represents a radius of curvature of an optical disc side surface of said first coupling lens,

wherein each of the light source side surface and the optical disc side surface of said first coupling lens has an aspherical surface having a positive aspheric amount at a maximum effective diameter thereof.

19. The optical system according to claim 18,

wherein said optical system satisfies a condition:

$0.30 < (-Rb/f) \times (M_{OBL1}/M_{REF})^4 < 1.00$ (7)

where M_{OBL1} represents a magnification of said objective lens when the diverging beam for said first optical disc having the spherical aberration given by said first coupling lens is incident on said objective lens, M_{REF} represents a magnification of said objective lens at which spherical aberration caused by said objective lens and the cover layer of said first optical disc takes a value closest to zero when a hypothetical diverging beam which is equivalent to the diverging beam for the first optical disc but has no aberration is incident on said objective lens, and f represents a focal length of said first coupling lens, the hypothetical diverging beam having a wavelength for said first optical disc.